

CEAL - 0467
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15 December 1958

MEMORANDUM FOR: Special Assistant to the Director
for Planning and Development

THROUGH : Director of D & F, NSA/DCI 15/ 14/17

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SUBJECT : Granger Mod 304 Program

1. On 10 December 1958 Mr. [] visited this Headquarters and gave additional information on the progress and status of the Granger Countermeasures program. Since his previous visit, three modifications have been made to the Mod 304:

a. The phase shift of the regenerator has been changed so as to be exactly 180 degrees out of phase with the intercept radar. This was not considered necessary to be so exact at the start of the program.

b. The shielding of the antenna has been determined to be less critical than anticipated and has been removed.

c. The automatic gain control has been removed from the electrical circuits of the system.

2. Each of these changes effectively increases the power output of the Granger box. With these changes, two flights have been flown against the F-3H radar system at Point Mags. Due to F-3H equipment malfunctions, no data was obtained other than pilot observations and comments.

3. Pilot comments concerning the attacks state that the Granger system did not cause the F-3H to break lock at any time during the attack. However, the system did cause a much larger confusion factor than on previous test flights. The F-3H pilot was doubtful that he could make a successful attack under the conditions presented on his radar scope.

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4. On the bad side, it must be pointed out that all of the gain realized in the three modifications cannot be realized in the final Granger box configuration. The changes allow for an effective power gain for long ranges but do not change the picture from previous results at closer ranges. In addition, the removal of the automatic gain control from the circuit, would cause the Mod 504 to become saturated at closer ranges and hence render the system useless. Thus, part of the positive results will be lost with refinement for overall capability.

5. When discussing refinements to the system, extensions of the flight test program must be considered for operational planning. We cannot expect to make many small changes, one at a time, and expect to receive high priority support from the Point Main facility. The black box should be put into the anticipated final configuration based on the results to date. Then, a new Phase II program can be arranged and run, if necessary. At that time, the desirability of the system and the need for additional testing should be able to be accurately determined. If the decision is to go ahead, Phase III should be put into operation rather than minor changes to Phase II. These minor changes can be done in Phase III. The need for additional testing and the desirability of countermeasures system will be greatly influenced by the results of the Room Clinic tests presently in progress.

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6. Discussion was also held with [] concerning the "beacon effect" that the Mod 504 has on a radar system such as installed in the F-104. The "effect" and the "reason" are as previously discussed. The F-104 radar needs to know only that a target is within its limit of vision. There is no pulse transmitter to be returned out of phase. The Granger box does receive this signal, magnify it and send it back to the F-104 stronger than a normal reflection and hence the "beacon effect." It must be remembered, however, that this effect occurs only after the F-104 has located the target and received a normal lock-on signal. The "beacon effect" does not help the F-104 locate the target. It must also be kept in mind that the basic principle of the Mod 504 operation is to magnify any lock-on signal and send it back to the intercept radar. However, against conical scan, pulse radar, this amplified signal is returned out of phase with normal reception and presents the image at a displaced space position. It is against this latter type radar that the Granger Countermeasures Repeater is expected to operate.

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RDH:aml (15 Dec 1958)

1 - SA/PD/DCI

2 - Operations

3 - Col. []

4 - Subject File

5 - Chrono

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